

Sept. 10, 1968

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3,400,922

METALLURGICAL VESSEL CONSTRUCTION

Filed April 6, 1966

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FIG. 1

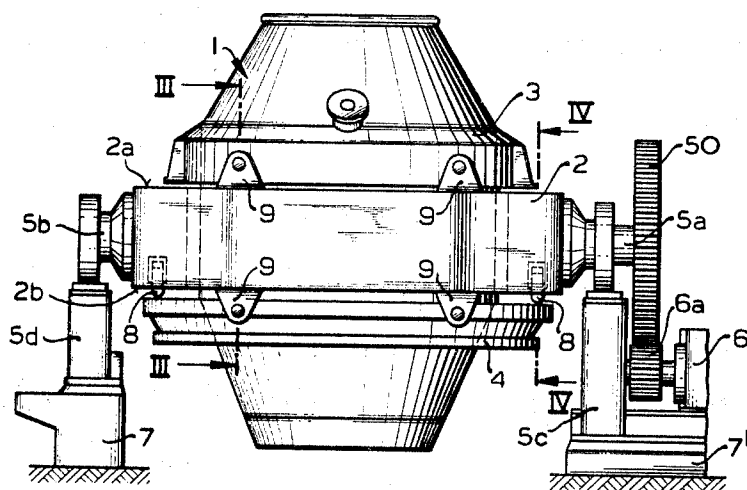
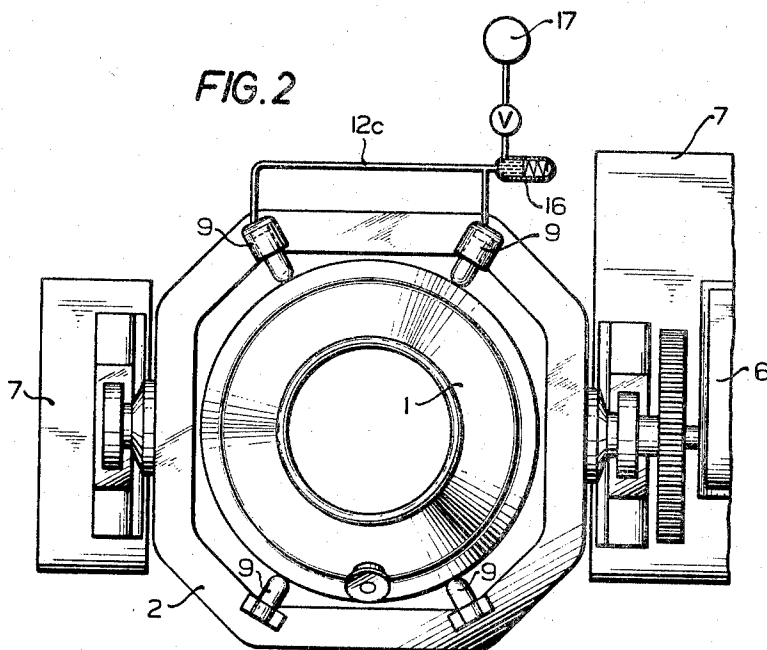


FIG. 2



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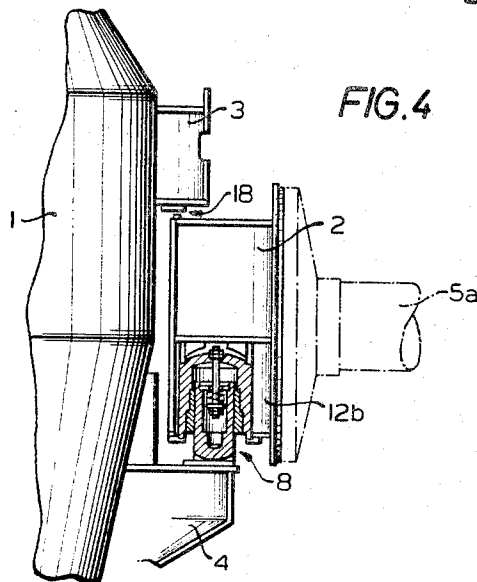
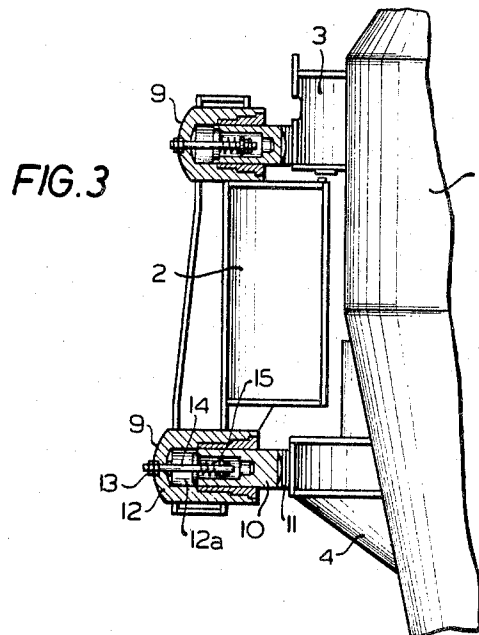
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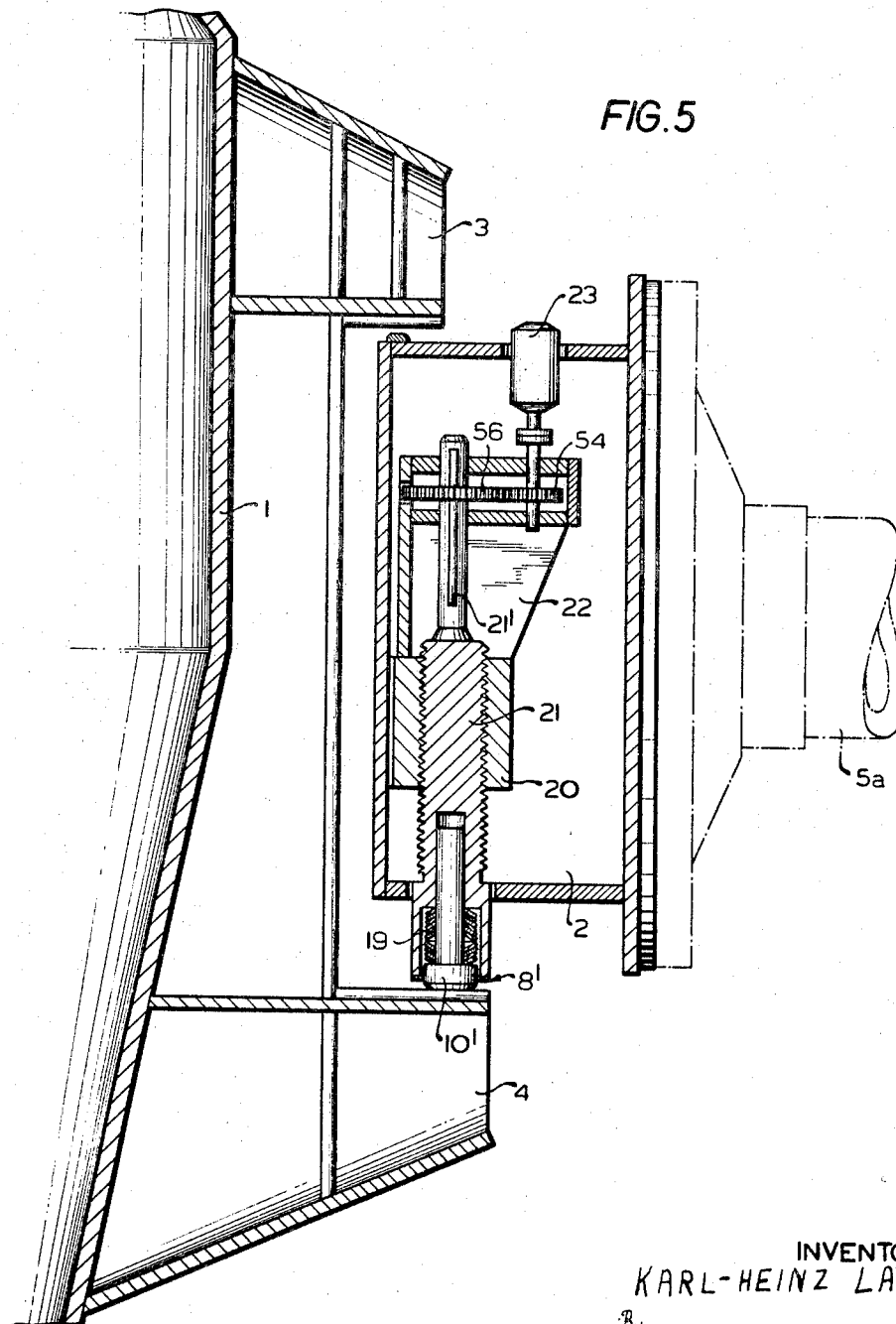
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METALLURGICAL VESSEL CONSTRUCTION

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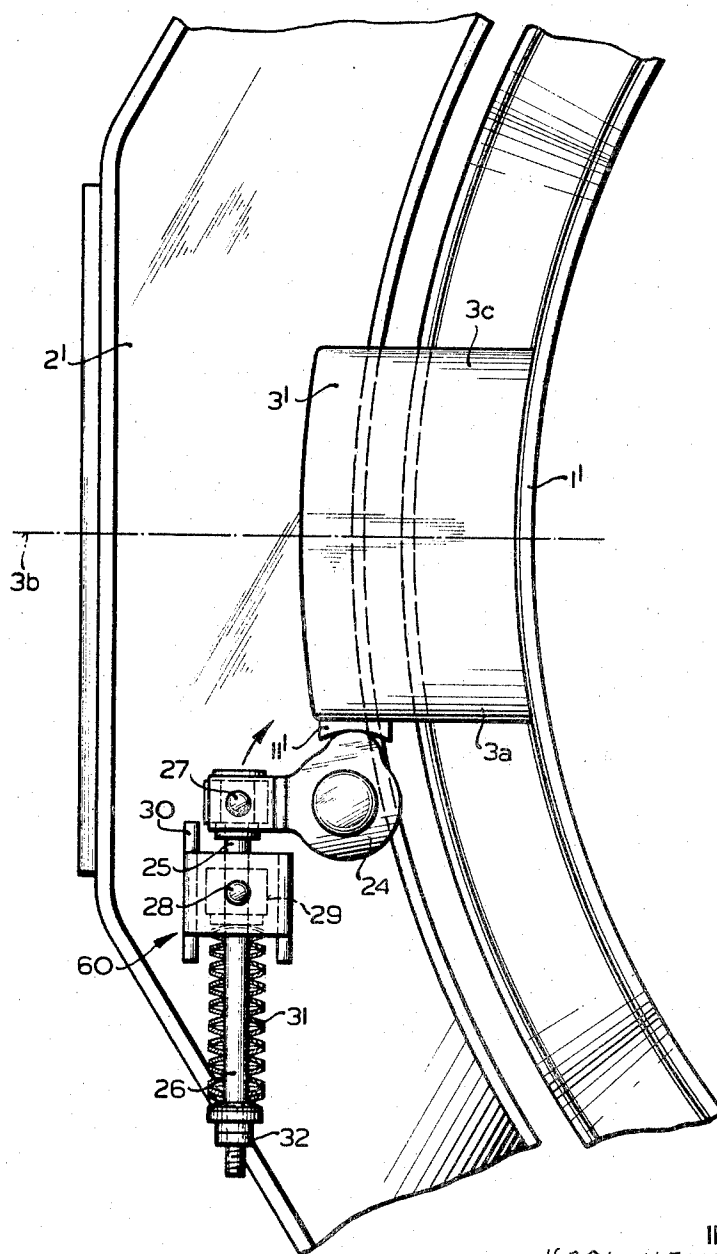
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METALLURGICAL VESSEL CONSTRUCTION

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FIG. 6



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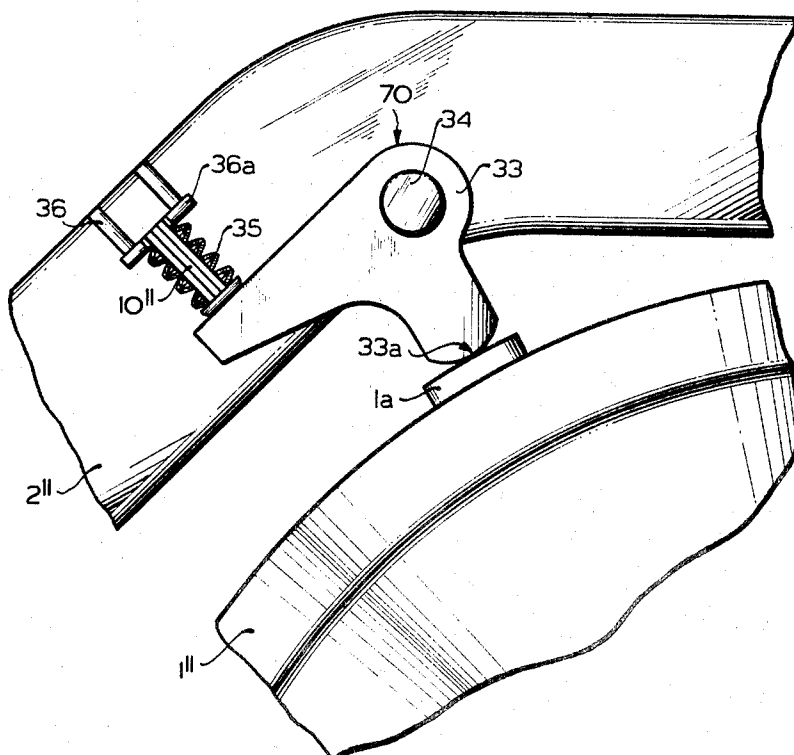
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FIG. 7



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METALLURGICAL VESSEL CONSTRUCTION
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D 47,015
16 Claims. (Cl. 266—36)

This invention relates in general to the construction of metallurgical vessels, and in particular to a new and useful metallurgical converter and supporting structure which includes a separate ring member which is pivotal or tiltable and means for supporting the vessel on the separate ring at spaced peripheral locations.

Various means have been suggested for supporting metallurgical vessels in a manner permitting the expansion of the walls thereof during the uneven heating of the vessel. A disadvantage in the prior art constructions, however, is the fact that with very large diameter vessels it is difficult to prevent deformation of the vessels during operation because of the great temperature stresses and deformations to which they are subjected. The deformations stem partly from internal stresses in the vessel jacket which extend outwardly into the vessel skin or wall and also partly from irregular radial expansion points or variations of the roundness of the vessel. A further disadvantage in the prior art constructions is that in the event it becomes necessary to replace a vessel or converter, it is possible that a new vessel will no longer fit in the supporting means or it may fit, but not as well as the previous one.

In accordance with the present invention, there is provided a supporting arrangement for converters of this type which permits variations of various wall portions of the vessel or support without materially affecting the mounting or orientation of the vessel in respect to its supporting structure. The supporting arrangement includes a ring, which is separate from the vessel and with means accommodated between the ring and the vessel for supporting it along both of the longitudinal axis and the radial axis. The supporting means advantageously include elastic or spring or pressure biased means which provide a somewhat resilient support between the ring and the vessel. Since the resilient elements are adjustable, any variations in the size of the vessel or the circumference of the supporting ring may be adjusted by the individual supporting elements. In a preferred arrangement, changes in shape of the vessel or the support which occur during operation may be compensated either automatically or by manually readjusting the supporting means. Temporary changes in shape due to overheated areas of the jacket of the converter will no longer cause over-stressing of the supporting elements. In a preferred construction, elastic supporting means are arranged to permit both longitudinal and radial expansion.

In a still further development of the invention, support is provided in directions perpendicular to the radial axis direction between spaced claw or ring formations formed on the vessel exterior wall and bearing surfaces which are firmly secured to or form part of the supporting ring. The invention is particularly applicable to vessels of large diameter which will be subject to correspondingly large distortion during operation. The supporting rings or claws of the vessel must follow such distortion movements, but at the same time, the vessel must be centered in respect to its supporting ring, which ring may be arranged substantially horizontally or tilted.

The support between the ring and the vessel is advantageously achieved in accordance with the invention such as by a plurality of piston elements carried on one of the members which bear against the surface of the other of

the members. For example, movable piston members are carried on the ring which bear at spaced radial locations around the periphery of the vessel. In addition, resilient longitudinal support must be given and for this reason additional piston members may be arranged on the ring to bear against a surface of the vessel or a ring there-around which is disposed in a plane perpendicular to the longitudinal axis so that support will be given in a longitudinal direction. The pistons may be members which may be set such as by moving a threaded member against a resilient spring contact arrangement. The member may be set by fluid pressure which is supplied from a separate fluid pressure source. Additional modifications in accordance with the invention advantageously include a pivotal lever member which may be made to bear against the vessel by rocking it on its pivotal mounting on the ring or biasing it on its pivotal mounting by means of resilient elements such as springs. In the preferred arrangement, the pre-loading of the various elastic support members, which are located either on the ring or on the vessel to provide a biasing of the vessel in respect to the ring, may be accomplished either jointly or separately or in individual groups such as by a motor drive or manually by hand. In those instances where a piston is employed, it is usually advantageous to provide means for initially resetting it to provide an initial resilient biasing and, in addition, to provide means for changing its setting or increasing the pressure of the biasing such as by a motor-driven threaded arrangement or by fluid pressure. Such fluid pressure piston systems are advantageously provided with means for cooling the surrounding cylinder and/or the piston in order to prevent any misalignment or misoperation of the various parts.

Accordingly, it is an object of the invention to provide an improved metallurgical vessel construction and a supporting means therefor.

A further object of the invention is to provide a metallurgical structure which includes a metallurgical vessel which is supported on a separate ring member which is pivotal preferably about one or more axes and which includes means for extending between the ring member and the pressure vessel for resiliently biasing the vessel in respect to the ring for supporting purposes.

A further object of the invention is to provide a supporting device for a metallurgical vessel which includes a separate ring member which is separately mounted for pivotal movement about, for example, a horizontal axis and which includes resilient means carried between the ring and the vessel which may be set to bear in both radial and longitudinal directions for the purposes of providing radial and longitudinal resilient support between the vessel and the ring.

A further object of the invention is to provide a metallurgical vessel construction which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

In the drawings:

FIG. 1 is a side elevational view of a metallurgical converter constructed in accordance with the invention;

FIG. 2 is a top plan view of the converter indicated in FIG. 1;

FIG. 3 is an enlarged sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is a partial sectional view taken along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged partial sectional view similar to FIG. 4 of another embodiment of the invention;

FIG. 6 is a partial plan view of a portion of a modified supporting ring structure for a converter constructed in accordance with the invention; and

FIG. 7 is a view similar to FIG. 6 of still another embodiment of the invention.

Referring to the drawings in particular, the invention as embodied therein in FIGS. 1 to 4 comprises a metallurgical reaction vessel or converter 1 having longitudinally spaced annular ring members or claws 3 and 4. The vessel 1 is supported on an annular member or supporting ring 2 which includes diametrically opposite supporting pins 5a and 5d which are mounted for pivotal movement or rotation about substantially horizontal axes on spaced pedestals or supporting journals 5d and 5c, respectively, which, in turn, are mounted on foundation elements 7 and 7', respectively. The arrangement includes a driving motor 6 which includes gear 6a driving gear 50 for the purpose of pivoting the shaft portions 5a and 5d which carry the ring 2.

In accordance with the invention, the vessel 1 is supported on the ring 2 by means of resilient supporting elements arranged at various locations in respect to the outer surface of the vessel 1. The supporting arrangement permits relative movement between the exterior wall of the vessel 1 and the ring 2 without causing damage to any of the elements or without causing the unbalancing condition of the vessel or the ring member. For this purpose, the resilient supporting means, as indicated, includes a plurality of radial resilient supporting means or elements generally designated 9 and a plurality of longitudinal resilient supporting means or elements generally designated 8. In the preferred arrangement, the radial supporting means 9 are arranged so that they are adjacent the ring members 3 and 4 formed as portions or as separate projecting elements of the vessel 1.

In the embodiment of FIGS. 1 to 4, the resilient supporting means 8 and 9 each includes a piston 10 having an outer dome-shaped end which rests in a similarly shaped pan or cup 11 which is carried on the respective ring members 3 and 4. The piston 10 is preferably slidable in cylinder housing 12 into which a control fluid may be admitted through conduits (not shown) for providing a pressure biasing of the piston 10 against the surface of the ring member 4 which is carried as part of the vessel 1. In the preferred construction, the piston may also be set from the exterior of the cylinder 12 by means of a nut 13 which is threaded onto a spindle 14 which is connected at its opposite end to the piston so that threading of the nut on the spindle 14 will effect the shifting of the piston 10 in respect to its seat 11 for the purpose of changing the biasing or bearing pressure thereon. Compression spring 15 also provides an initial biasing or return movement force on the piston 10 in addition to any fluid pressure which is applied in the space 12a.

As indicated in FIG. 2, the cylinders 12 are advantageously connected either singly or in pairs or similar groupings through connecting lines 12c to a pressure accumulator or chamber 16 which receives pressure from a fluid pressure source 17. The cylinders 12 are advantageously enclosed or surrounded by jackets 12b through which a cooling fluid may be directed.

As indicated in FIG. 3, the radial support elements may be located to bear against the outer or circumferential surfaces of the ring members 3 and 4. The longitudinal supports may be arranged as indicated in FIG. 4, for example, where a cross bar or frame member 18 is provided at one end, for example the top end, and the pressure means 8 are provided at the lower end and bear upwardly.

In the embodiment illustrated in FIG. 5, the resilient supporting means 8' includes a piston bolt member 10' which is biased downwardly by means of disk-shaped springs 19 which are arranged around the shank portion

of the piston member 10'. The entire assembly includes a threaded spindle portion 21 which is displaceable in respect to a fixed nut member 20 which is carried on the ring 2. Adjustment of the spindle member 21 may be made either initially or continuously by means of a driving motor 23 which drives through a gear 54 and a gear 56 affixed to an end portion 21' of the spindle 21 to cause rotation thereof in a selected direction.

In the embodiment illustrated in FIG. 6, a ring 2' is provided with means for resiliently supporting a vessel 1' which is provided with a plurality of projections or supports 3' rather than an annular member 3 as in the other embodiments. In this embodiment, resilient support is provided in a direction substantially perpendicular to the axis of the vessel 1 and to the supporting axis of the ring 2'. The resilient supporting means comprising an assembly generally designated 60 which includes a supporting head 24 which bears against a pan 11' carried on a side face 3a of the projection 3'. The head 24 is rotatable around a shaft member 25 which includes a rear spindle extension 26. A pin 27 is provided at the forward end around which the supporting head 27 can rotate. Spindle 26 is mounted in a journal 28 of a slide ring 29 which is slidable in a housing 30. The housing 30 is rigidly mounted on the ring 2'. The nut 29 is shiftable in a direction perpendicular to the central radial lines 3b. When the claw side 3a makes any pivotal or rotational movement, the supporting head 24 is rotated and spindle 26 is moved. A plurality of dish springs 31 which are arranged around the spindle are compressed. The initial tensioning and the readjustment of the springs 32 is effected by means of a nut 32. In a preferred arrangement, an additional supporting element similar to the assembly 60 is provided to bear against the end face 3c.

In the further modification indicated in FIG. 7, there is provided resilient supporting means 70 arranged between a ring 2'' and a reaction vessel 1''. In this embodiment, the housing 1'' is provided with a bearing projection 1a and the ring is provided with a crank member or two-armed lever 33 having a surface 33a which is urged against the bearing surface 1a under the force of a piston 10''. Dish springs 35 bias the piston 10'' against one arm of the double-armed lever 33 which is pivoted around the pivot location or pin 34 which is carried on the ring 2''. A supporting block 36 for the piston is rigidly connected to the ring 2'' and it includes an outer wall 36a against which the springs 35 are biased. It should be appreciated that a piston similar to the piston 10'' may also be located at the projection 1a of the converter vessel 1''. Similarly, the rounded head portion 33a of the double-armed lever may include a movable piston which is actuatable such as by a fluid pressure control.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A metallurgical vessel construction comprising a vessel housing, a ring surrounding the housing for supporting the vessel housing at a predetermined orientation, and resilient supporting means connected between said ring and said housing at a plurality of locations for resiliently supporting said vessel housing on said ring.

2. A metallurgical vessel construction, according to claim 1, including means supporting said ring for pivotal movement.

3. A metallurgical vessel construction, according to claim 1, wherein said resilient supporting means includes a plurality of supporting members bearing radially in respect to the axis of said vessel housing.

4. A metallurgical vessel construction, according to claim 1, wherein said resilient supporting means includes a plurality of members bearing substantially parallel to the longitudinal axis of the vessel housing.

5. A metallurgical vessel construction, according to

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claim 1, wherein said housing includes spaced annular ring members, said resilient supporting means including a plurality of members bearing in longitudinal directions in respect to the vessel housing against said ring members.

6. A metallurgical vessel construction, according to claim 5, further including a plurality of members bearing radially inwardly at spaced locations around said vessel housing.

7. A metallurgical vessel construction, according to claim 1, wherein said resilient supporting means includes at least one member bearing in a direction perpendicular to the radial axis of said vessel housing.

8. A metallurgical vessel construction, according to claim 7, including means for supporting said ring for pivotal movement about a substantially horizontal axis.

9. A metallurgical vessel construction, according to claim 1, including means for supporting said ring for pivotal movement about a substantially horizontal axis, said housing including a radially extending projection formed on each side thereof, said resilient supporting means including a member bearing against a side of said radial projection of said housing.

10. A metallurgical vessel construction, according to claim 1, wherein said resilient supporting means include a cylinder mounted on said ring, a piston slidable in said cylinder, and means for resiliently setting said piston against said housing at a predetermined pressure.

11. A metallurgical vessel construction, according to claim 10, including a motor for connecting said means for setting said piston to effect setting thereof at a predetermined biasing pressure.

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12. A metallurgical vessel construction, according to claim 1, including a plurality of cylinders located around said housing, a piston slidable in said cylinders, and means for pressurizing said cylinders for providing a biasing pressure between said housing and said ring.

13. A metallurgical vessel construction, according to claim 12, wherein said pressurizing means includes means for spring loading said pistons.

14. A metallurgical vessel construction, according to claim 12, wherein a plurality of cylinders are connected together for supplying a predetermined fluid pressure thereto.

15. A metallurgical vessel construction, according to claim 12, including means for cooling said fluid cylinders.

16. A metallurgical vessel construction, according to claim 1, wherein said resilient supporting means include a pivotal crank member, and means for biasing one arm of said crank member to position the other arm in biased engagement between said ring and said housing.

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